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Video Recording

Camera Setup

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Introduction to basic camera settings

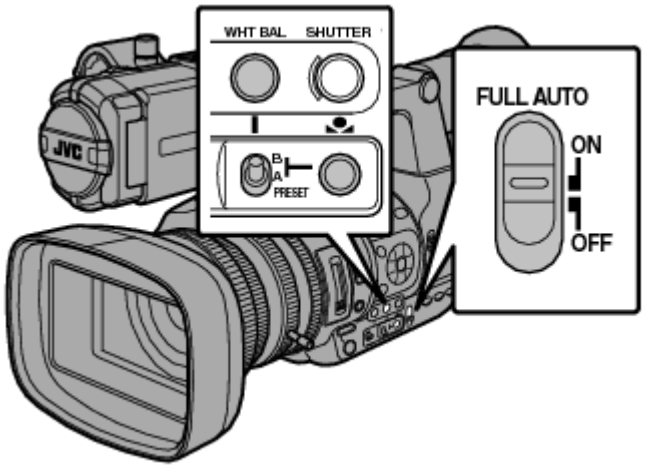
- Every professional camera has a set of basic parameters that affect image quality.
- These parameters include light, color, exposure, and sharpness control.
- Adjustments can be made manually or automatically.
- ENG cameras (e.g. JVC, Sony, Panasonic) have physical switches for quick access.
- DSLR and mirrorless models use menus and screen options.
- Proper adjustment ensures consistent image quality every time you shoot

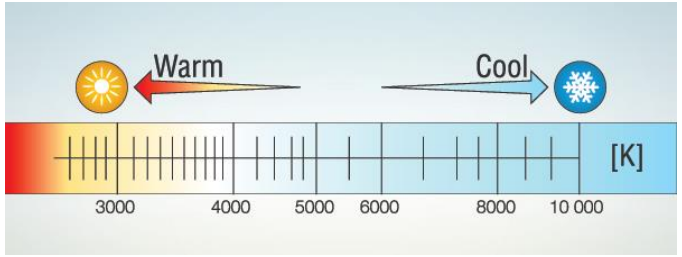
Balans white (White Balance)

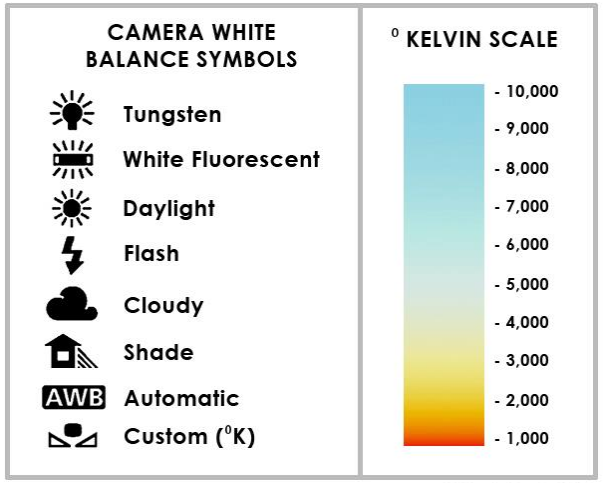
- White balance aligns the camera with the light temperature.
- Presets: **3200K (tungsten)** and **5600K (daylight)**.
- Manual: Measurement via **gray or white card**.
- On ENG cameras, there are **A and B memories** for user WB values.
- Automatic WB useful in dynamic conditions but unstable.
- In the studio, a manual WB is used for all cameras to keep them in sync.

Balans white (White Balance)

- Wrong WB image is dragged to blue or orange.
- In a multicam setup, a **mismatched** WB creates noticeable differences in th
- Digital profiles: Fine tune options (e.g. ± values in Kelvin).
- Example: ENG camera JVC fast switching between stored WBs.
- Additional options: **ATW (Auto Tracking White Balance)** for fieldwork.
- Recommendation: always calibrate before starting recording.







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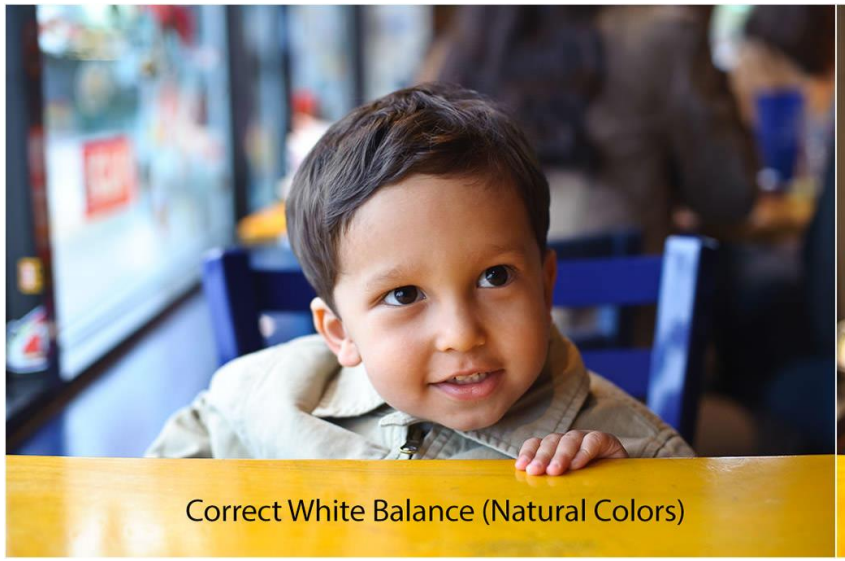
Balans white (White Balance)



Correct White Balance (Natural Colors)

Incorrect White Balance (Too Orange)

Gain and ISO

•Gain (expressed in dB) and ISO (DSLR/Mirrorless code) determine the sensor sensitivity.

•Lower gain,cleaner image, higher gain, brighter but with noise.

•ENG cameras have **L, M, H switches** (e.g. –6 dB, 9 dB, 18 dB).

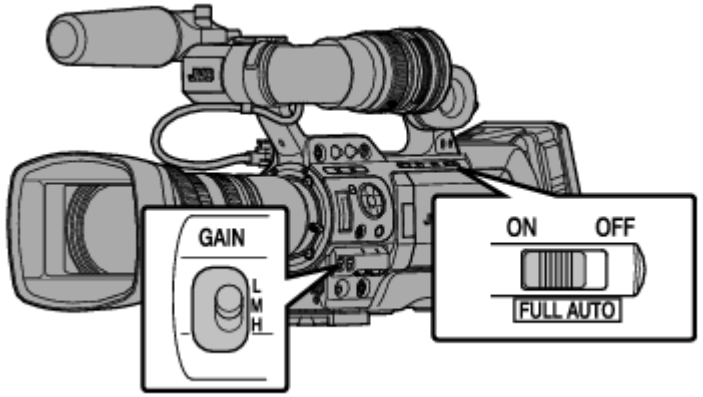
•AGC (Automatic Gain Control) – adjusts the gain automatically.

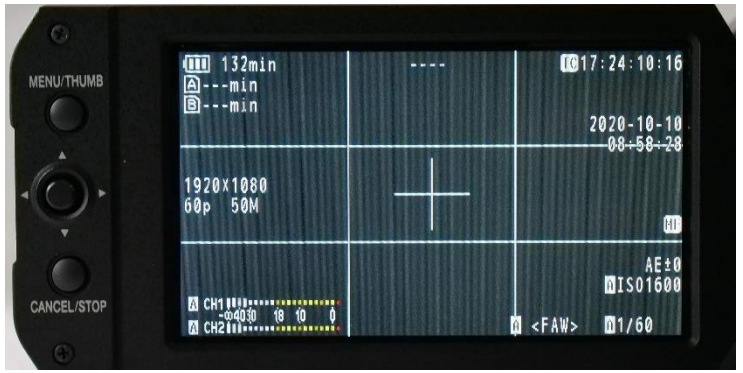
•JVC cameras also have a **LoLux mode** for extreme low light.

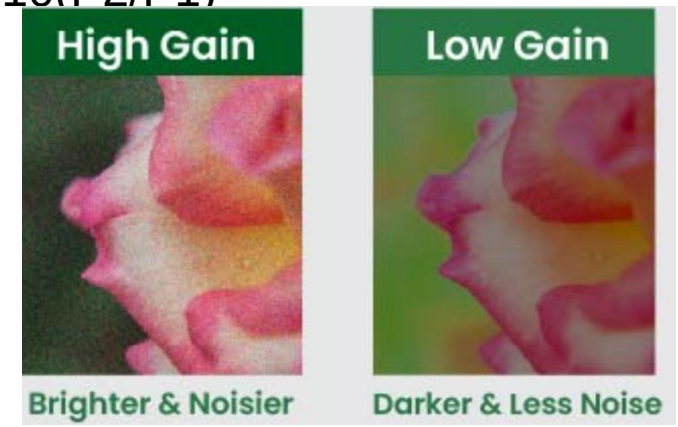
•Recommendation: use the smallest gain that gives an acceptable exposure.

•If we are talking about *voltage* amplification: dB=20log •10(G)

•If we are talking about *power/potency* (luminous intensity ~ power): dB=10log? 10(P2/P1)



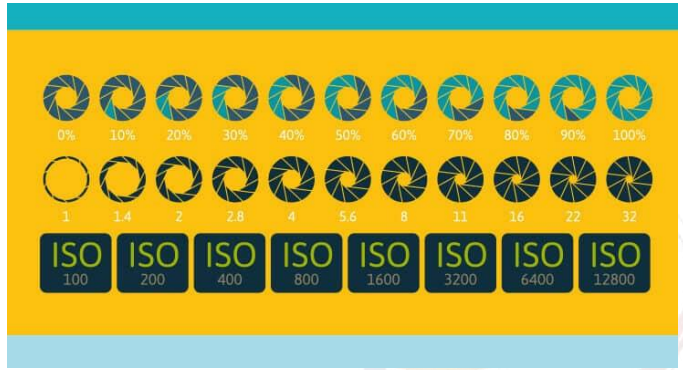




Gain and ISO

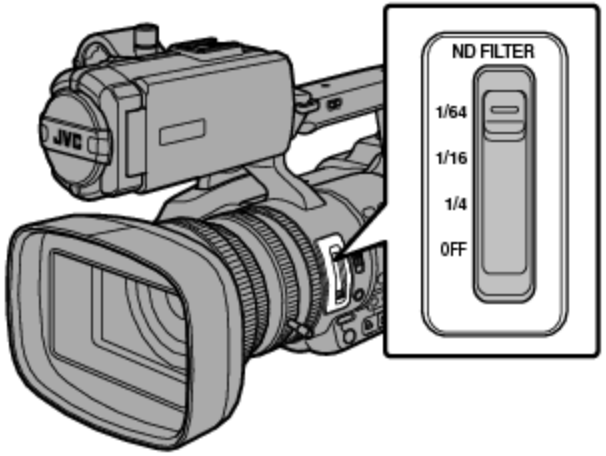
- ISO values (e.g. 100–3200) often with DSLR/Mirrorless cameras.
- A higher ISO speeds up shooting in the dark but adds digital noise.
- In multicam operation, all cameras must be at the same gain/ISO level.
- Example: ENG camera with 0 dB gain in the studio, +9 dB in the field.
- The balance of exposure and noise is key to broadcast quality.
- Trend: new cameras offer **dual native ISO** for flexibility.

- Measured in **stop** = brightness **doubling**.
- If you increase the ISO from 100 to 200, this is a 1 stop increase (the signal is 2x).
- General ratio: multiplier = 2^number of stops
- Example: +2 ft : 2^2 = 4× gain (ISO 100 → ISO 400).



ND Filters

- ND filters reduce the amount of light without changing the color.
- They allow working with an open aperture in bright sunlight.
- ENG cameras offer mechanical filters: Clear, 1/4, 1/16, 1/64.
- They prevent "burnt out" frames in daylight.
- They allow creative effects (shallow depth of field outside).
- ND filters are crucial for sports and outdoor shooting.

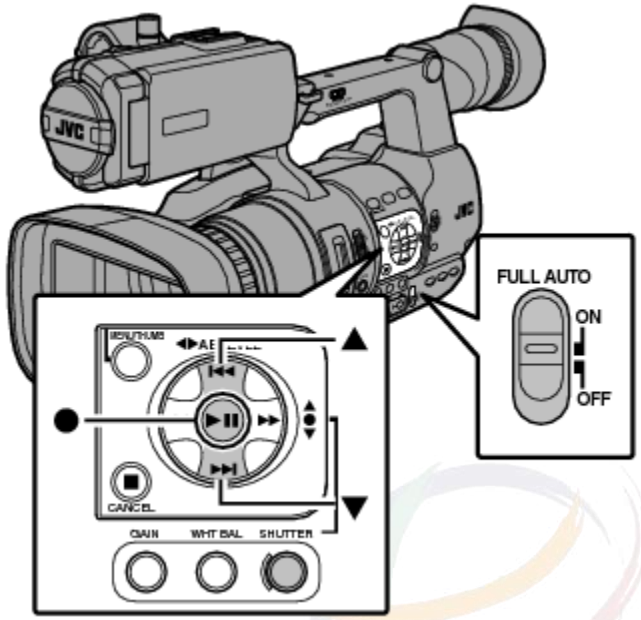


ND Filters

- Example: recording an interview outside, without ND filter image burnt out.
- With ND filter: exposure controlled, natural look.
- Electronic ND filters offer continuous values.
- In the multicam setup, all cameras must use the same ND settings.
- ND filters are often combined with polarizers.
- Without an ND filter, it is almost impossible to shoot in 4K HDR in bright light.

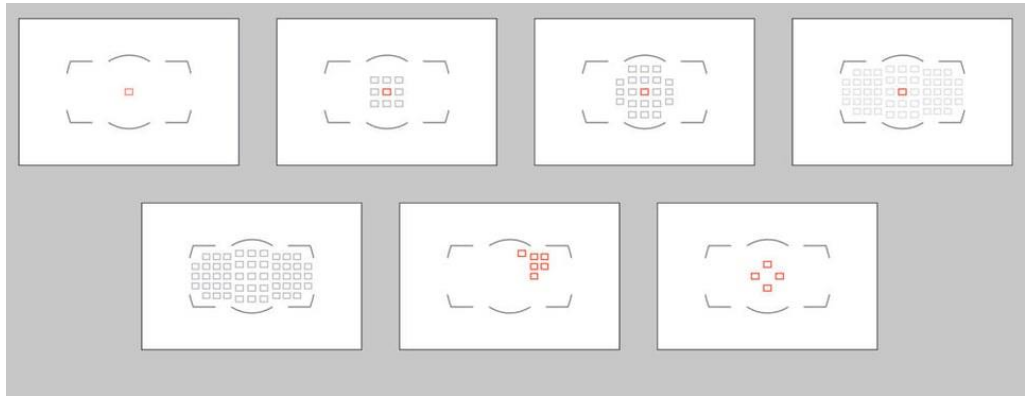
Full Auto Mode

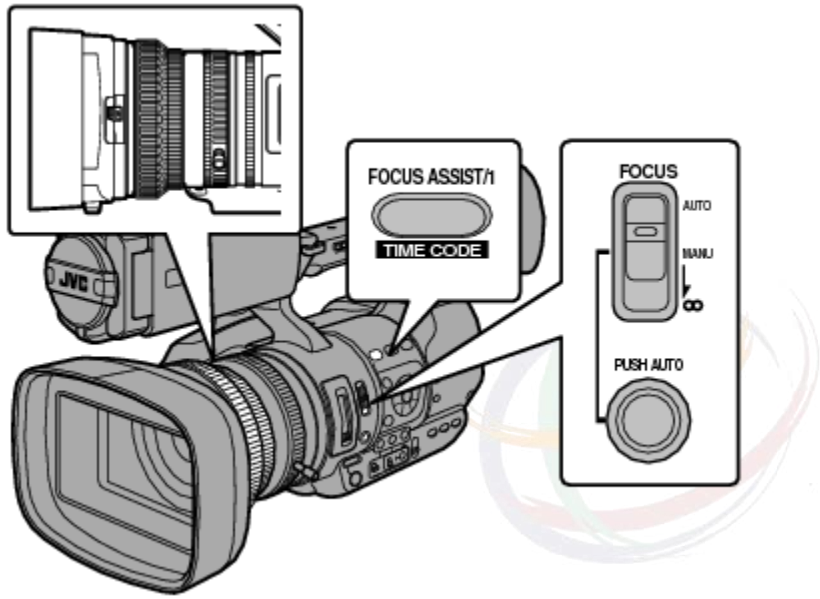
- The camera automatically adjusts **exposure, white balance, gain, and focus**.
- Suitable for quick situations where there is no time for manual adjustment.
- Often used in ENG cameras during news and “on the go” reports.
- Disadvantage: parameters can "jump" during recording (color, light, focus).
- Professionals use it only as a temporary option.
- In multicam setup – not recommended, as cameras will not be matched.



Auto/Manual Focus

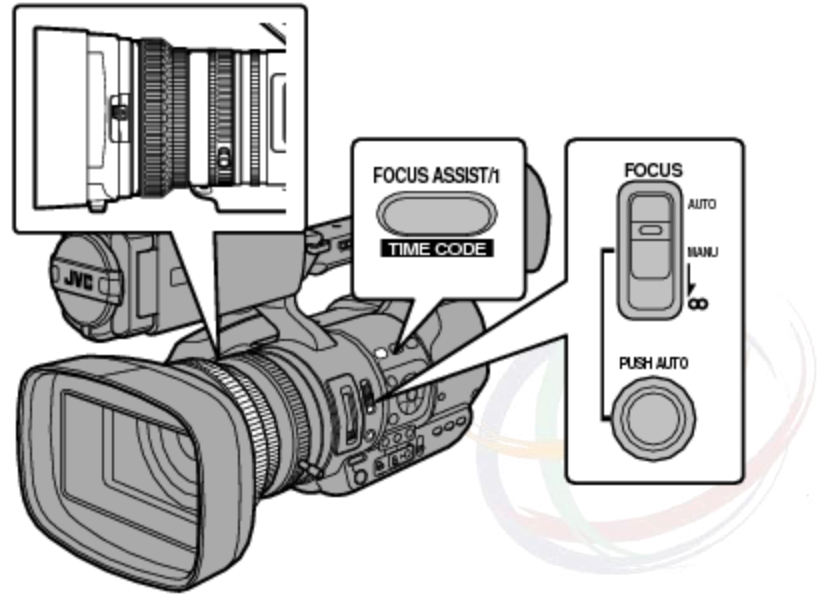
- **Autofocus** responds quickly to changes and is practical for dynamic events.
- **Manual focus** gives full control and stability during shooting.
- In a multicam setup, manual focus is required to avoid changes in the frame.
- DSLR and mirrorless have advanced AF algorithms (eye-tracking, face-tracking).
- ENG cameras offer a physical ring for manual focus.
- The car is used in sports, news and field shooting.





Focus Assist and Peaking

- **Focus Assist** helps the operator to visually confirm the focus.
- The most common tools: **peaking (colored edges in focus)** and magnifying part of the image.
- It is used in manual focus in demanding conditions.
- ENG cameras often have a dedicated Focus Assist button as well as a ring.
- DSLR/mirrorless offer a magnify option on the screen/viewfinder.
- Required for 4K and 8K recording where focus is critical.



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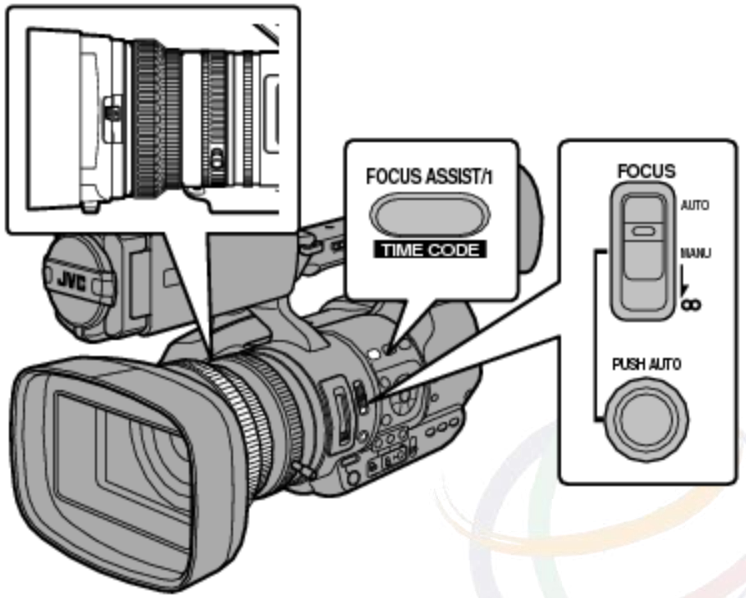
One Push Auto

- “One Push Auto” allows quick focusing at the touch of a button.
- It is used when the operator wants manual control, but also a quick reset of the focus.
- Ideal for interviews immediate focus on the subject, then manual adjustment.
- It only works while the button is pressed.
- Prevents AF “wandering” in complex scenes.
- Often combined with manual focus in ENG and the camcorder.



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How to focus

•Focus charts are used to **accurately manually focus** the camera.

•The camera is positioned according to the focus map and manually adjusted until the lines are completely sharp.

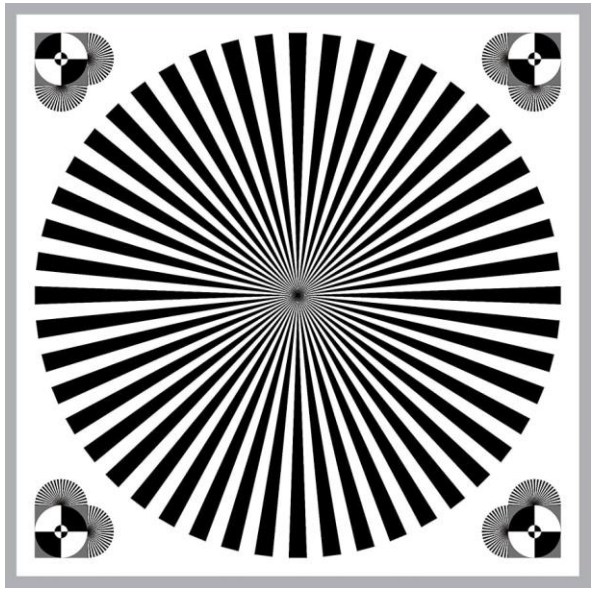
•They are most commonly used in **studio conditions, equipment tests and camera calibration**.

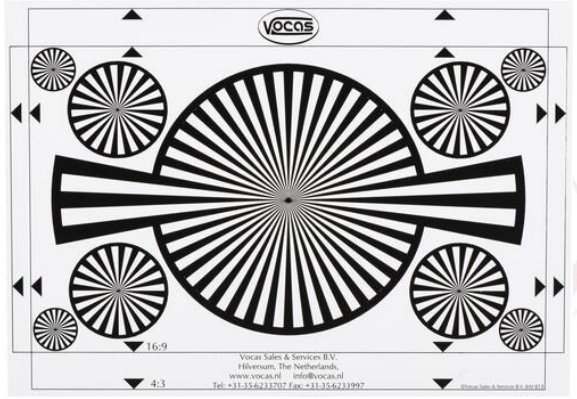
•They help with multi-camera kits so that all cameras have the same focus.

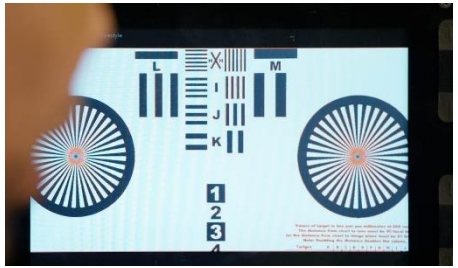
•They are often combined with the **Focus Assist / Peaking function** for added control.

•They are also used in film production when preparing lenses.

•If there are no focus maps, zoom in on the object being recorded, find its edges and focus







Camera internal settings

- In addition to basic physical controls, cameras also offer detailed settings through the **Settings menu**.
- There are options for **picture, color, exposure, sound, and system settings**.
- ENG and camcorders have physical quick access keys + advanced options menu.
- DSLRs and mirrorless cameras have most of the controls through the menu and touchscreens.
- Proper use of these options allows full control over the appearance of the image.

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Picture Profiles

- The cameras offer ready-made image profiles: **Standard, Cine, Vivid, Neutral, Log**.
- Each profile changes contrast, color, saturation, and gamma curve.
- "Cine" and "Log" profiles allow a wider dynamic range (later color correction).
- “Standard” and “Vivid” are used for direct output (without additional processing).
- ENG cameras usually use the Rec.709 standard for TV broadcasting.
- In multicam operation, → all cameras must be on the same profile.

Color settings

- In addition to the profile, it is possible to adjust the image parameters manually.
- Controls: **Gamma, Black Level, Knee, Saturation, Sharpness**.
- Professional cameras offer very precise menu controls.
- Contrast and color adjustment is used for fine corrections.
- "Black Level" affects the depth of the black color and details in the shadows.
- "Knee" controls the prominent parts of the image (prevents burnout).
- DSLR/mirrorless offer simplified controls (Brightness, Contrast, Saturation).

Zebra pattern and Marker

•**Zebra pattern** – Displays overexposed parts of the image.

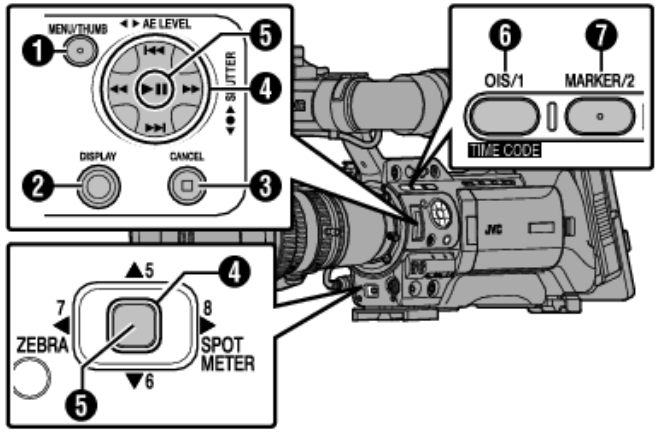
•Typical setting: Zebra at 70% (for skin complexion) or 100% (for white areas).

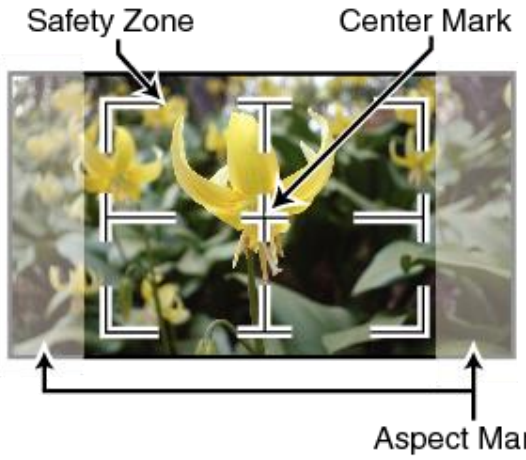
•**Marker** – frame guides: safe area, center, aspect ratio (16:9, 4:3).

•They help the cameraman adhere to TV and film standards.

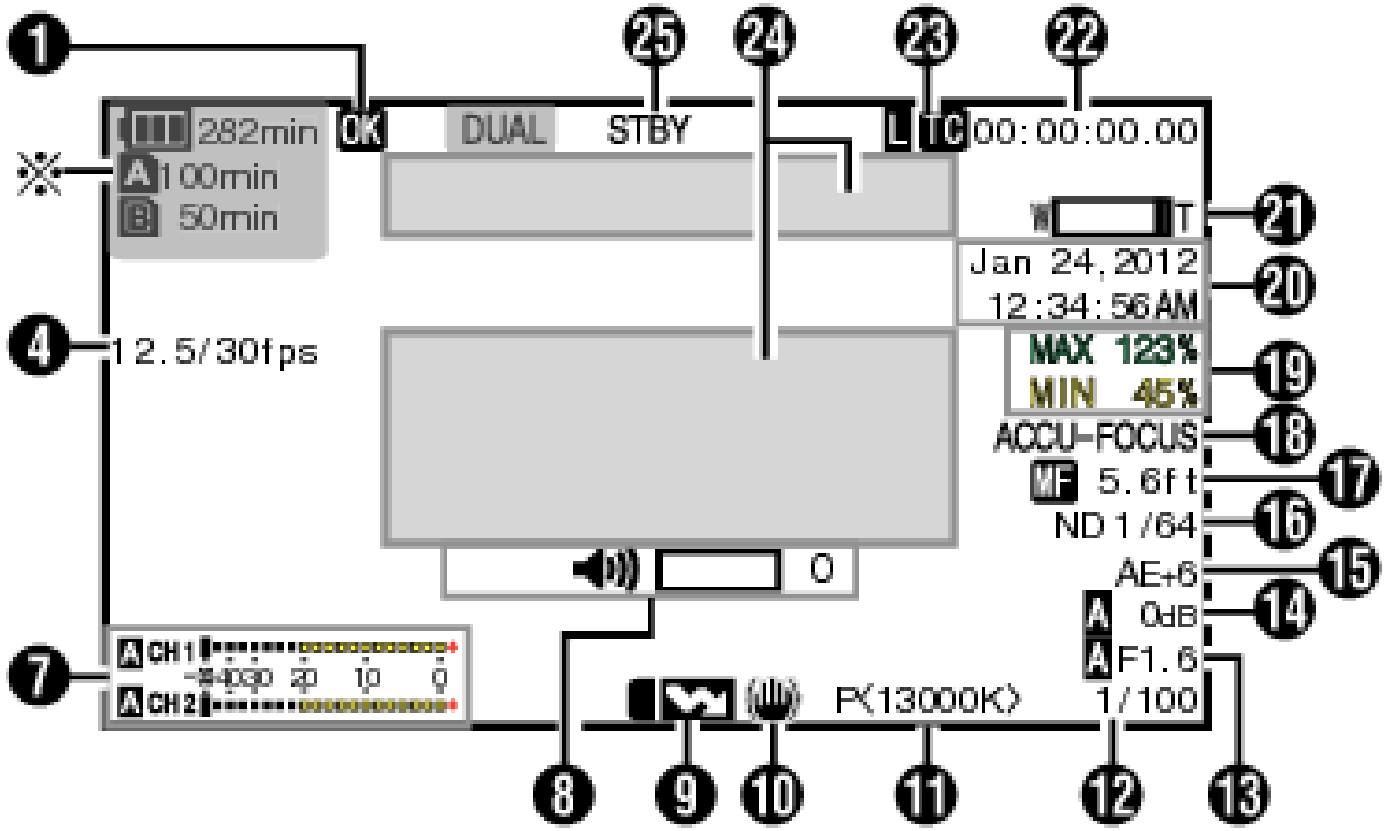
•The zebra is a key exposure tool for ENG and the camcorder. Take care that the brightest parts can have a zebra. Zebra must not be on human skin.

•The marker is important for framing in multicam and directing productions.





Information on the display



Display and EVG

•Each camera has a basic monitoring system: **EVF (electronic viewfinder)** and LCD screen.

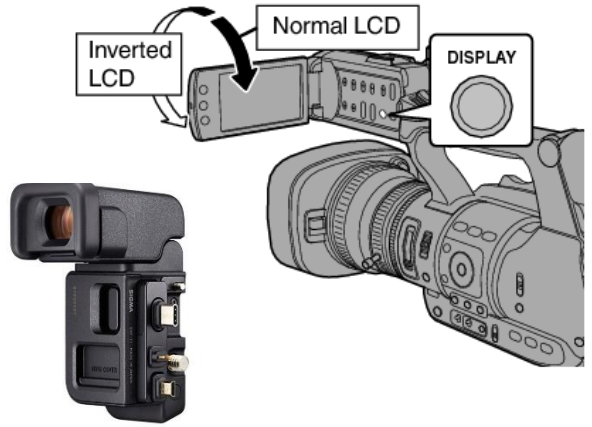
•EVF is used in bright light and for more accurate framing.

•The LCD display is convenient for quick viewing and menus.

•Professional cameras offer **high resolution and false color**.

•In a multicam setup, external monitors are often used for directing.

•**False color** uses different colors to display the exposure (e.g. green = correct).



•Allows quick estimation of light and contrast.

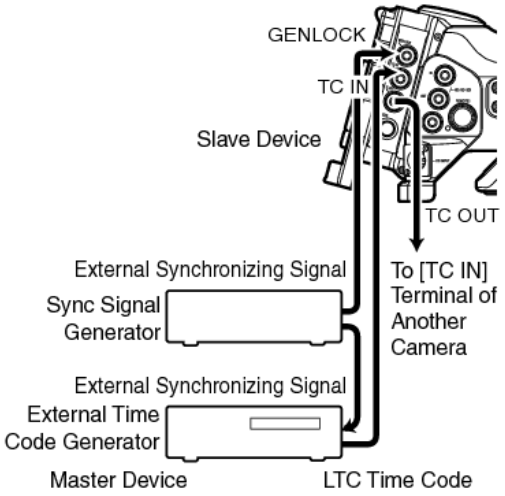
•**LUT monitoring** allows the Log recording to be displayed in the standard Rec.709 format.

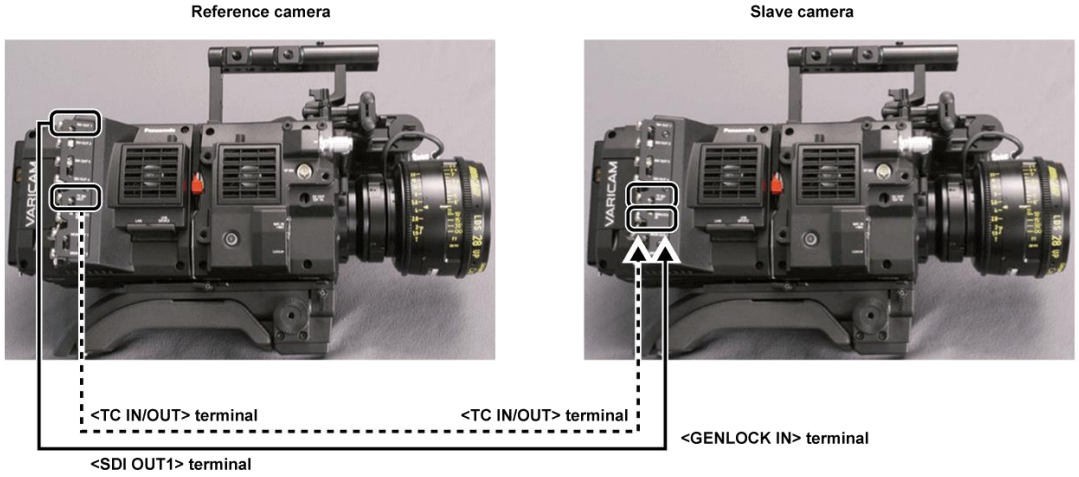
•The cameraman sees a realistic appearance, and the material remains in the Log fo

•It is used in film and TV production.

Timecode and camera synchronization

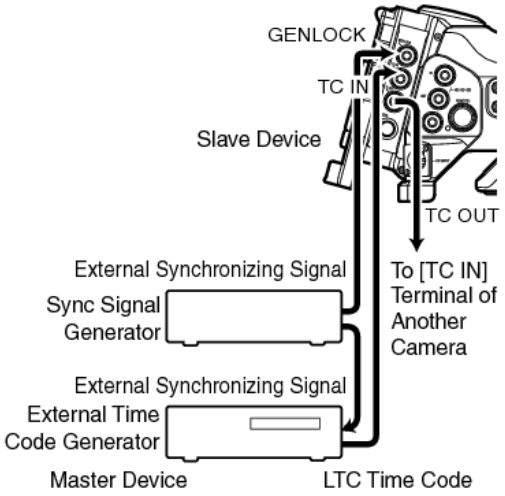
- **Timecode** ensures that all cameras have an identical timestamp.
- Used to synchronize images in multicam editing.
- It can be **built into the camera** or distributed externally.
- In ENG production, **jam sync** (temporary synchronization) is often used.
- In studio production, all cameras are synchronized with the central generator.





Genlock and multicam setup

- **GENLOCK** ensures that all cameras operate at exactly the same time (frame sync).
- Used in live TV production and overhead setups.
- All cameras receive a signal from the **central sync generator**.
- Without a genlock, the image may "jump" when switching.
- Mandatory in multicam studios and OB (Outside Broadcast) circuits.



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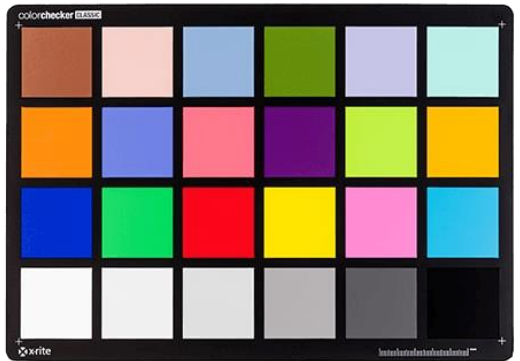
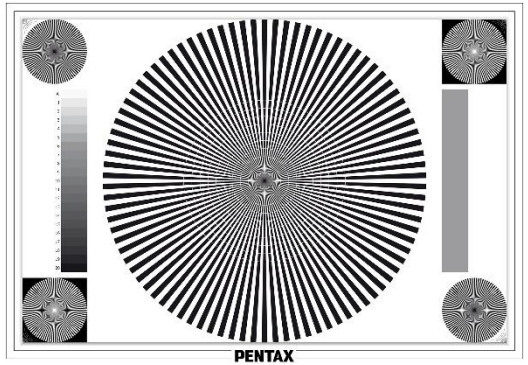
Calibration

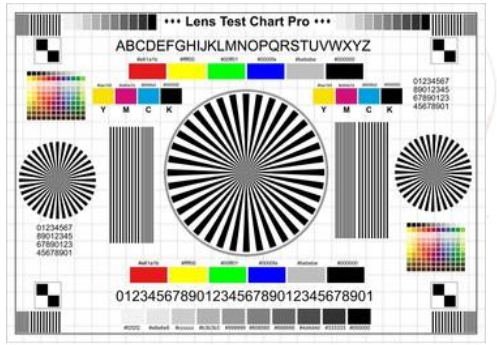
- Calibration ensures **consistent image appearance** on all cameras.
- The goal is to accurately reproduce color, contrast, and exposure.
- It is used in **multicam setups, studios and film productions**.
- The most important tools: **gray cards, color checker, test patterns, vectorscope**.
- Calibration is usually done before the start of recording.
- Result: all cameras give a uniform signal ready to be directed.

Calibration tools: gray map, color checker and focus maps

- **Gray card (18% gray)** – used to fine-tune exposure and white balance. It allows consistent skin tones and elimination of the battle offset.
- **Color checker** – map with reference colors (e.g. X-Rite) for faithful color reproduction and subsequent color correction in post-production.
- **Focus maps** – special samples (Siemens star, checkerboard) for manual focus adjustment and camera resolution testing.
- All of these tools are used in **multicam setups** to ensure all cameras have matching color, exposure, and sharpness.
- Standard practice in studios, film sets and professional TV productions.

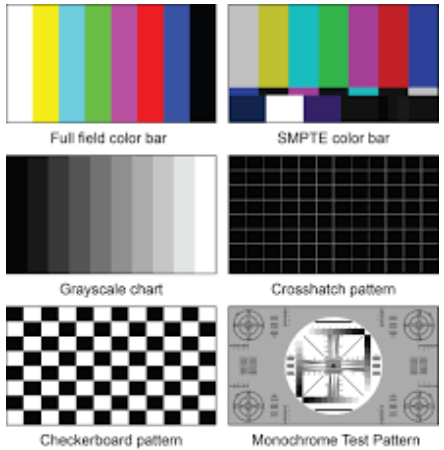


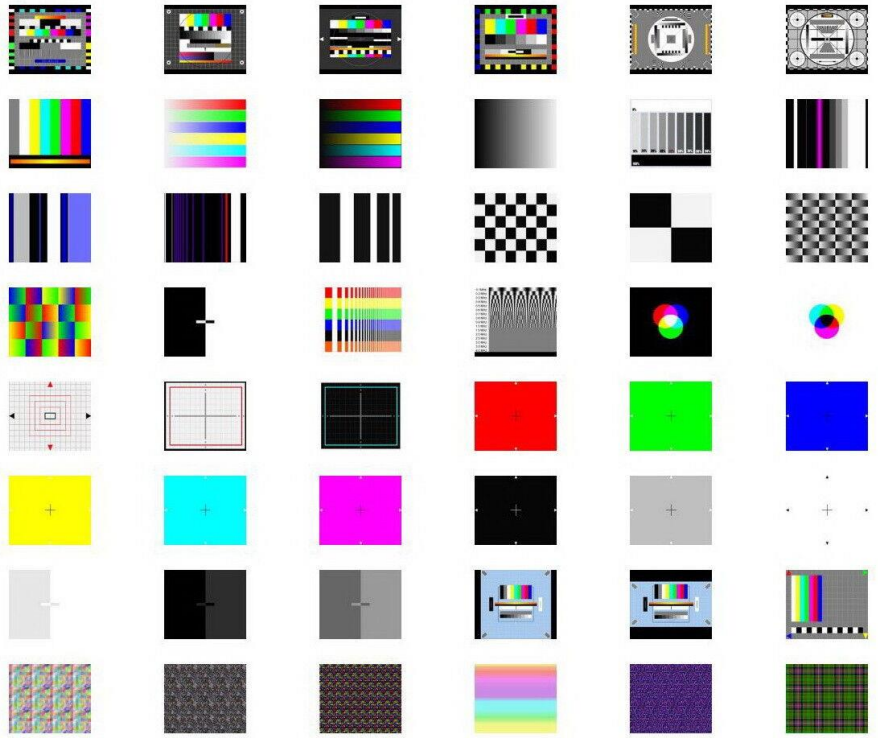




Test patterns and monitoring

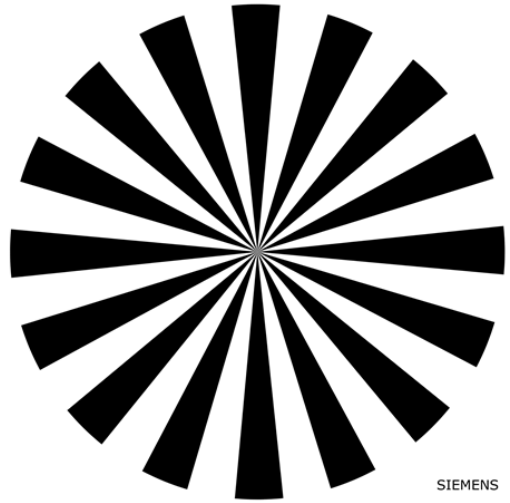
- Test signals: **Color bars, pluge, Grayscale, Multiburst**.
- They are used to check the level of brightness, contrast and colo
- Monitoring via **waveform monitor and vectorscope**.
- PLUGE allows proper adjustment of the black color.
- The Grayscale test checks the tonal range of the sensor.
- The multiburst test checks the horizontal resolution.
- Standard practice in TV and broadcast production.





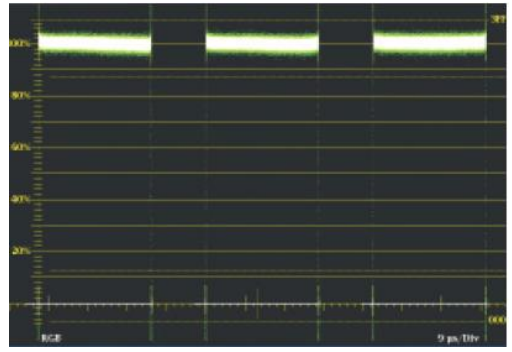
How to set up?

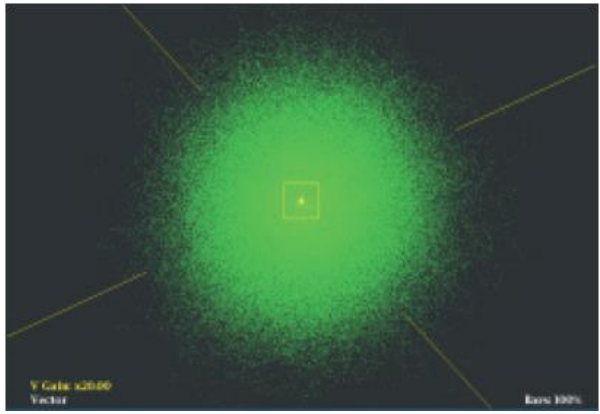
- The test card (**Siemens star**) is placed on the studio wall, the camera is about **3 meters** away.
- The camera zooms into the center of the map and focuses using **the focus ring**.
- Next step: the lens zooms out to the minimum focal length.
- If there is **no image blur** during zoom out, the back-focus is well adjusted.
- If blurring occurs, an **F.B. (flange back) correction ring** is used.
- The process is repeated: → zoom → focusing zooming out, until the image remains sharp in all positions.
- Sometimes it takes more repetitions for the back-focus to be completely accurate



How to set up?

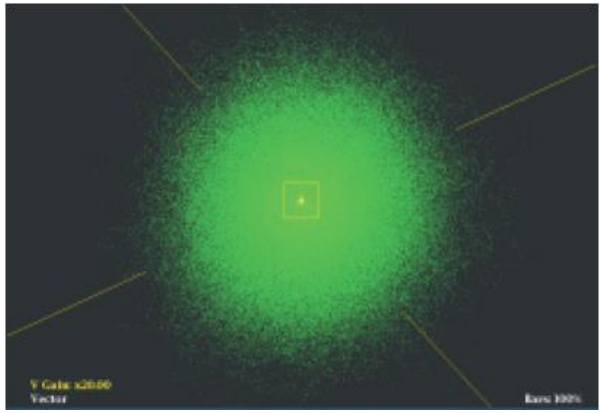
- The camera is mounted on a tripod and directed towards the scene where it will be filmed.
- A **large piece of white styrofoam or a white** card is placed in the center of the light.
- The ND filters must be switched off and the iris set to servo control.
- On the camera controller, the **W.BAL** button is pressed and the manual mode is selected.
- The color balance is adjusted using **R and B potentiometers**.
- Objective: to **get a point in the center** (neutral white) on the vectorscope.
- On the waveform monitor, the signal level should be 100 IRE.
- If the balance is correct the lines in the RGB display are straight and the same.

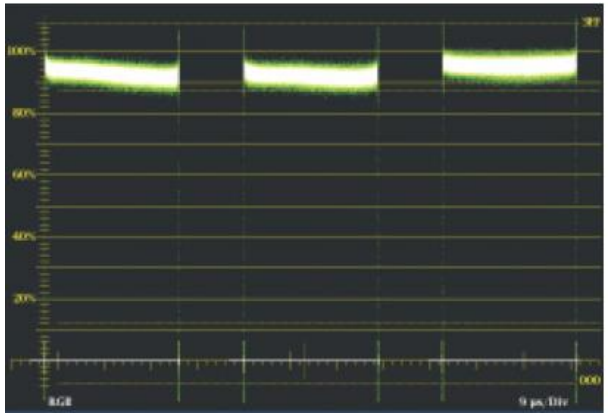




How to set up?

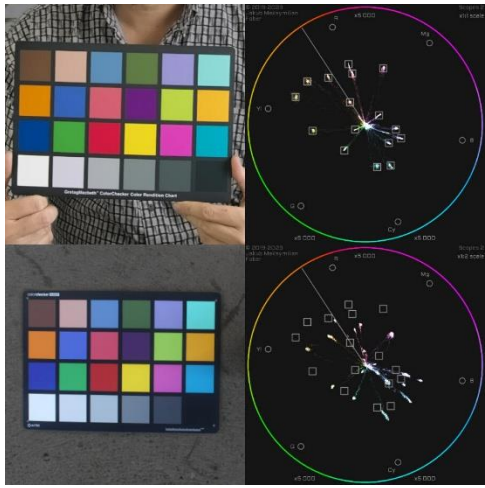
- **Incorrect white balance:** the colour deviates towards green, blue or red
- **Correctly adjusted white balance:** the vectorscope shows a point in the center .
- If Ultrascope **software is used**, it is possible to magnify the display (20x) for accurate analysis.
- Incorrect color balance→, poor skin appearance, and incorrect exposure.
- The correct balance ensures color consistency in multicam productions.

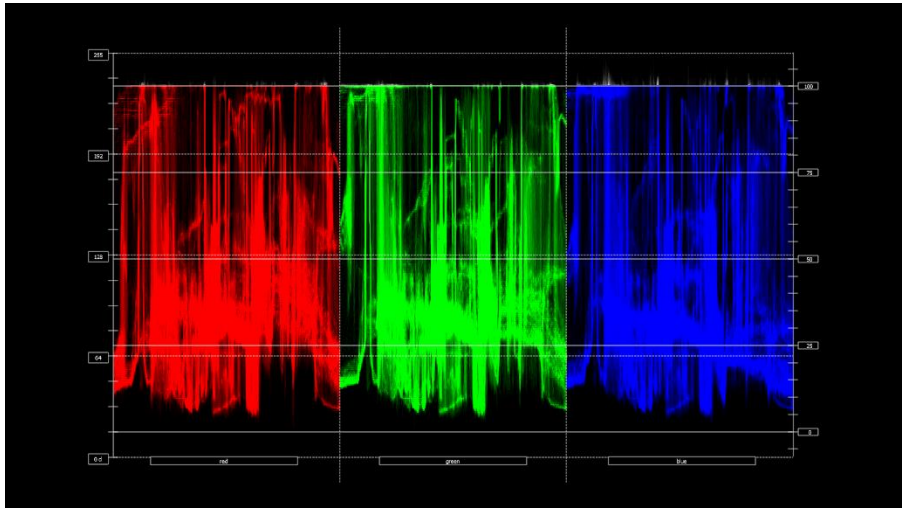


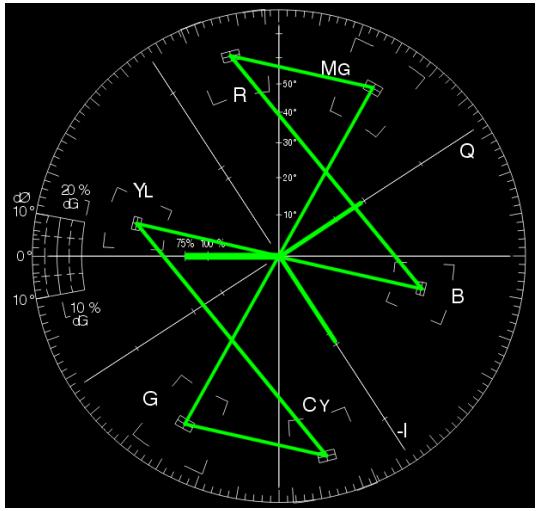


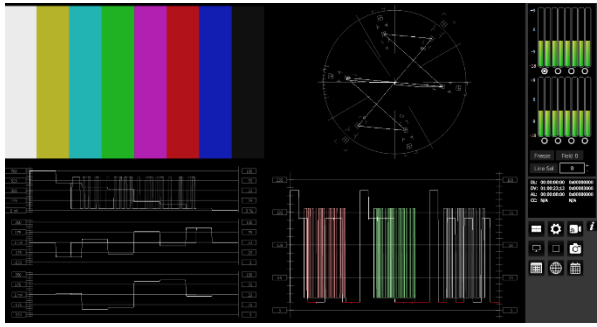
How to set up?

- The camera is directed to the test card and the monitoring on the vectorscope is activated.
- Each color should fall within its **standard marker** on the vectorscope diagram.
- The waveform monitor checks whether the colors are within the limits of **0–100 IRE**.
- If the colors deviate, it is necessary to correct the **gain, saturation and chroma balance**.
- The most critical colors to check: **red, blue, green and skin tones**.



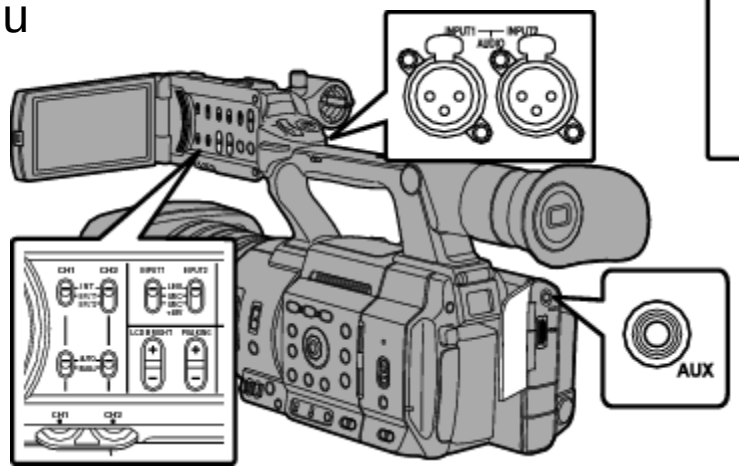


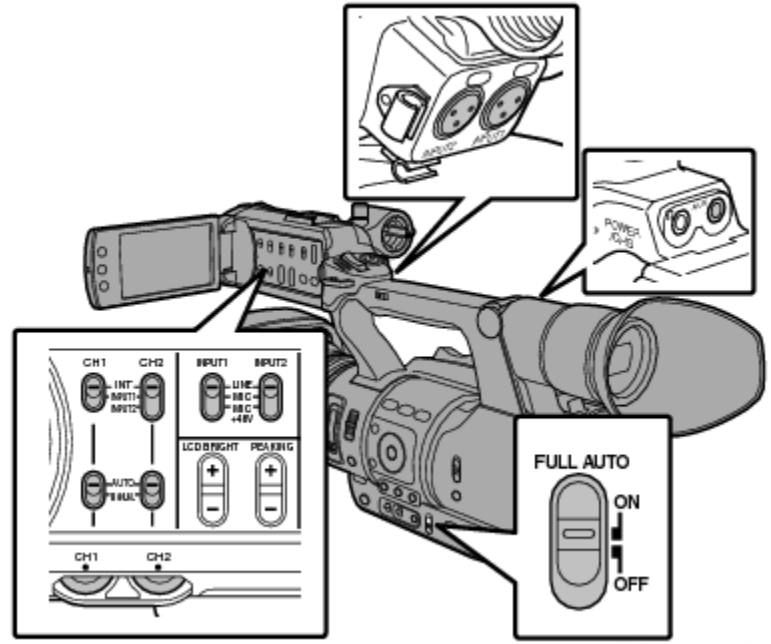




Audio settings in the menu

- Cameras allow you to choose between **internal and external microphones**.
- XLR inputs can be set to **Line/Mic level** and with **phantom power (48V)**.
- Audio gain can be automatic (Auto) or manual (Manual).
- Channel balancing: CH1, CH2, stereo, mono.
- Audio monitoring via headphones and audio meter display.
- ENG and the camcorders have separate audio dials for quick control.
- Audio can also be customized in the menu





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Tripods and multicam production

- The tripod ensures **the stability of the camera** and allows precise movements.
- In a multicam setup, tripods are key to frame consistency.
- Tripod types: **light (for ENG), studio (with heavy heads), pedestal (TV studios)**.
- The head of the tripod determines the quality of movement (pan/tilt).
- The role of the tripod: reducing cameraman fatigue and ensuring a professional look.

Tripod adjustment

- First, the **height and legs of the tripod** are adjusted – they must be level.
- A **bubble level** is used for precise leveling.
- The camera is mounted on **a quick-release plate** and balances by center of gravity.
- The fluid head allows **soft pan and tilt movements**.
- Axle locking prevents unwanted movement.
- In multi-camera production, all tripods are adjusted to the same heights for frame consistency.

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Tripod adjustment

- The camera must be properly **balanced on the tripod plate**.
- If not – the camera will drop forward or backward with the head unlocked.
- The balance is adjusted by moving the camera on the plate until it stands still.
- Larger ENG/studio cameras require precise balancing due to lens weight.
- In a multicam setup, the balance of all cameras must be equal.
- In a multicam setup, cameras are placed in strategic positions: main, secondary, detail, audience.

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Camera Setup

- The setting of the camera depends on the **type of production**: ENG, studio or film production.
- Each situation has specific **lighting, monitoring and stabilization** requirements.
- Special equipment (cranes, sliders, steadicam, gimbal) enables creative camera movements.
- Practical examples show how theory transitions into professional practice.

ENG production (terrain/field)

- Quick setup, lightweight equipment and mobility.
- ENG camera with integrated lens and XLR inputs.
- White balance and exposure are often adjusted as you go.
- Tripod lightweight, portable, quick installation.
- Monitoring viewfinder + transfer to the direction via SDI/NDI.
- The focus is often manual to avoid mistakes in interviews and reports.

Studio production (TV shows)

- Large studio cameras with CCU control and genlock sync.
- Camera mounted on **a pedestal** with a fluid head.
- All parameters set manually and identically for all cameras.
- Monitoring directed by: multiview + vectorscope.
- The lighting is fixed, so the exposure setting is standardized.
- The director communicates with the cinematographers via the intercom.

Film production

- The cameras use **Log profiles** and record raw for post-production.
- Focus is done with the help of the **focus** puller and marker on the lens.
- Stabilization: sliders, steads, gimbals, cranes.
- White balance and exposure are adjusted using the gray map and monitor with LUT.
- Monitoring on set: external monitors and direction for ITD (Digital Imaging Technician).
- Special emphasis on color control and dynamic range.

Practical example: concert and movie

- **Concert:** Multicam setup with multiple tripods, crane and steadicam.
  - Each camera covers a specific angle (main scene, audience, details).
  - Directed monitoring ensures image consistency and camera synchronization.
  - The crane gives dynamic shots above the audience, allowing the steads to move fluidly through the crowd.

- **Movie:** Shooting with a slider and gimbal for creative movements.
  - The focus puller uses markers to precisely control the focus.
  - White balance and exposure are adjusted using the gray map and LUT monitoring.
  - The camera shoots in raw format, with subsequent color grading.
  - Stabilization (gimbal/slider) gives a cinematic look.

Practical example: Broadcast production (sports and TV show)

- **Sports production:**
  - Cameras placed along the terrain (main, detail, goal, audience).
  - Synchronization using **genlock and timecode**.
  - Main camera on pedestal, additional on cranes and sliders.
  - ENG cameras are used for quick interviews and live engagements.
  - Monitoring directed by: multiview + instant replay system.

- **TV show (studio production):**
  - Setup with 3–5 cameras on the pedestal.
  - The director coordinates all cameramen through the intercom.
  - All cameras are set to the same **white balance and picture profile**.
  - Color and exposure monitoring is performed on the vectorscope.
  - Dynamic shots are achieved using a crane or jib system.

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The most common mistakes in practice

- Poor camera balance on a tripod and falls.
- Wrong WB between different color cameras in multicam setup.
- Ignoring audio monitoring bad sound and noise.
- Using the wrong stabilization of unusable personnel.
- Non-compliance with standards (IRE, vectorscope) of images outside broadcast limits.

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Best Practice Recommendations

- Always calibrate all cameras before recording.
- Use the same picture profiles and WB values for the multicam setup.
- Monitoring via external monitors and vectorscope.
- Balance the camera on a tripod before starting shooting.
- Select the stabilization according to the scene (tripod, steadicam, gimbal).

WBnet

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Questions & Answers

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